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File: USPT

Feb 10, 2004

US-PAT-NO: 6689358

DOCUMENT-IDENTIFIER: US 6689358 B2

TITLE: Phytase variants

DATE-ISSUED: February 10, 2004

## INVENTOR-INFORMATION:

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US-CL-CURRENT: [424/94.6](#); [435/195](#), [435/196](#), [435/252.3](#), [435/320.1](#), [435/471](#), [435/911](#), [435/916](#), [530/350](#), [536/23.2](#), [536/23.7](#)

## CLAIMS:

What is claimed is:

1. A modified phytase comprising a mutation in an amino acid sequence of a phytase, wherein the modified phytase has phytase activity and the mutation is at one or more positions selected from the group consisting of: 45, 61, 79, 118, 126, 172, 173, 199, 203, 203a, 234, 238, 240, 360, 366, and 411, wherein each position corresponds to the position of the amino acid sequence of the mature *P. lycii* phytase (SEQ ID NO: 7).
2. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: 45S; 61R; 118V; 126S,V; 172P; 173Q,S; 203R,K,S; 203aV,T; 238L; 340A; 360R; 366S,V; and 411K,T.
3. The modified phytase of claim 1, wherein the phytase is an ascomycete phytase.
4. The modified phytase of claim 3, wherein the phytase is an *Aspergillus* phytase.
5. The modified phytase of claim 4, wherein the phytase is an *Aspergillus* ficuum, *Aspergillus fumigatus*, *Aspergillus nidulans*, *Aspergillus niger*, or *Aspergillus terreus* phytase.

6. The modified phytase of claim 5, wherein the phytase is an *Aspergillus terreus*, CBS 116.46 phytase.
7. The modified phytase of claim 1, wherein the phytase is a *Myceliophthora thermophila*, *Talaromyces thermophilus*, or *Thermomyces lanuginosus* phytase.
8. The modified phytase of claim 7, wherein the phytase is a *Myceliophthora thermophila*, ATCC 34625 or ATCC 74340 phytase.
9. The modified phytase of claim 7, wherein the phytase is a *Talaromyces thermophilus*, ATCC 20186 or ATCC 74338 phytase.
10. The modified phytase of claim 7, wherein the phytase is a *Thermomyces lanuginosus*, NRRL B-21527 phytase.
11. The modified phytase of claim 1, wherein the phytase is an ascomycete consensus phytase sequence.
12. The modified phytase of claim 1, wherein the phytase is a basidiomycete phytase.
13. The modified phytase of claim 12, wherein the phytase is an *Agrocybe pediades*, *Paxillus involutus*, *Peniophora lycii*, or *Trametes pubescens* phytase.
14. The modified phytase of claim 13, wherein the phytase is a *Paxillus involutus*, CBS 100231 phytase.
15. The modified phytase of claim 14, wherein the phytase is a *Paxillus involutus*, CBS 100231 Phy-A2 phytase.
16. The modified phytase of claim 13, wherein the phytase is a *Trametes pubescens*, CBS 100232 phytase.
17. A feed or food comprising a modified phytase of claim 1.
18. A composition comprising a modified phytase of claim 1.
19. A process for reducing phytate levels in animal manure comprising feeding an animal with an effective amount of the feed of claim 17.
20. The modified phytase of claim 1, comprising a mutation at position 45.
21. The modified phytase of claim 1, comprising a mutation at position 61.
22. The modified phytase of claim 1, comprising a mutation at position 79.
23. The modified phytase of claim 1, comprising a mutation at position 118.
24. The modified phytase of claim 1, comprising a mutation at position 126.
25. The modified phytase of claim 1, comprising a mutation at position 172.
26. The modified phytase of claim 1, comprising a mutation at position 173.

27. The modified phytase of claim 1, comprising a mutation at position 199.
28. The modified phytase of claim 1, comprising a mutation at position 203.
29. The modified phytase of claim 1, comprising a mutation at position 203a.
30. The modified phytase of claim 1, comprising a mutation at position 234.
31. The modified phytase of claim 1, comprising a mutation at position 238.
32. The modified phytase of claim 1, comprising a mutation at position 340.
33. The modified phytase of claim 1, comprising a mutation at position 360.
34. The modified phytase of claim 1, comprising a mutation at position 366.
35. The modified phytase of claim 1, comprising a mutation at position 411.

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=> s phytase and (?75W or ?75F or ?78D or ?78S or ?81A or ?81G or ?81Q or ?81E or ?82T or ?84I o  
'?75W' NOT LONG ENOUGH FOR LEFT TRUNCATION  
You have entered a truncated stem whose length is less than  
the minimum allowed for left truncation in the requested  
search field. You may increase the length of the stem to  
the minimum allowed and try again. Enter HELP SFIELDS to  
to find the minimum stem length for left truncation in  
the requested search field.

=> s phytase and (75W or ?75F or ?78D or ?78S or ?81A or ?81G or ?81Q or ?81E or ?82T or ?84I or  
'?75F' NOT LONG ENOUGH FOR LEFT TRUNCATION  
You have entered a truncated stem whose length is less than  
the minimum allowed for left truncation in the requested  
search field. You may increase the length of the stem to  
the minimum allowed and try again. Enter HELP SFIELDS to  
to find the minimum stem length for left truncation in  
the requested search field.

=> s phytase and (75W or 75F or 78D or 78S or 81A or 81G or 81Q or 81E or 82T or 84I or 84Y or 8  
L1 4 PHYTASE AND (75W OR 75F OR 78D OR 78S OR 81A OR 81G OR 81Q OR  
81E OR 82T OR 84I OR 84Y OR 84Q OR 84V OR 116S OR 119E OR 120L)

=> dup rem l1  
PROCESSING COMPLETED FOR L1  
L2 2 DUP REM L1 (2 DUPLICATES REMOVED)

=> d l2 1-2 ibib ab

L2 ANSWER 1 OF 2 HCAPLUS COPYRIGHT 2005 ACS on STN DUPLICATE 1  
ACCESSION NUMBER: 1989:110813 HCAPLUS  
DOCUMENT NUMBER: 110:110813  
TITLE: Immobilization of *Aspergillus ficuum* **phytase**  
: product characterization of the bioreactor  
AUTHOR(S): Ullah, Abul H. J.; Phillippy, Brian Q.  
CORPORATE SOURCE: South. Reg. Res. Lab., USDA, New Orleans, LA, 70124,  
USA  
SOURCE: Preparative Biochemistry (1988), 18(4), 483-9  
CODEN: PRBCBQ; ISSN: 0032-7484  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB A. *ficuum* **phytase** was covalently immobilized on Fractogel TSK  
HW-75 contg. 2-oxy-1-alkylpyridinium salts. A packed-bed bioreactor was  
constructed with the immobilized **phytase**. An HPLC ion-exchange  
method was used to analyze the enzymic products of the bioreactor.  
Immobilized fungal **phytase** was able to hydrolyze myo-inositol

hexa-, penta-, tetra-, tri-, and diphosphates. When the substrate soln. was recirculated for 5 h in the bioreactor, .apprx.50% inorg. orthophosphate was released and myo-inositol diphosphate and monophosphate were the only remaining products.

L2, ANSWER 2 OF 2 HCAPLUS COPYRIGHT 2005 ACS on STN DUPLICATE 2  
ACCESSION NUMBER: 1988:34095 HCAPLUS  
DOCUMENT NUMBER: 108:34095  
TITLE: Immobilization of Aspergillus ficuum extracellular  
**phytase** on Fractogel  
AUTHOR(S): Ullah, Abul H. J.; Cummins, Barry J.  
CORPORATE SOURCE: South. Reg. Res. Cent., USDA, New Orleans, LA, 70124,  
USA  
SOURCE: Biotechnology and Applied Biochemistry (1987), 9(5),  
380-8  
CODEN: BABIEC; ISSN: 0885-4513  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB A. ficuum **Phytase** (EC 3.1.3.8) was covalently immobilized on Fractogel TSK HW-75 F contg. 2-oxy-1-alkylpyridinium salts which were readily susceptible to nucleophilic displacement of the SH and NH<sub>2</sub> groups of the enzyme. The catalytic parameters and stability of the immobilized fungal **phytase** were studied. No shift in the pH optima of the immobilized enzyme was obsd. compared to that of the free enzyme. The apparent optimal temp. of the immobilized enzyme was 65.degree., whereas that of the sol. enzyme was 58.degree.. The apparent Km of the immobilized enzyme for phytate was significantly higher than that of the free enzyme. As a consequence of immobilization, enhanced stabilities to heat treatment were obsd. The immobilized enzyme was able to hydrolyze >50% of the orthophosphate from phytate upon recirculation for a period >5.0 h at 25.degree..

=> d his

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L1 4 S PHYTASE AND (75W OR 75F OR 78D OR 78S OR 81A OR 81G OR 81Q OR  
L2 2 DUP REM L1 (2 DUPLICATES REMOVED)

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FULL ESTIMATED COST	25.19	25.40
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE	TOTAL
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File: USPT

Feb 4, 2003

US-PAT-NO: 6514495

DOCUMENT-IDENTIFIER: US 6514495 B1

TITLE: Phytase varinats

DATE-ISSUED: February 4, 2003

INVENTOR-INFORMATION:

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Pasamontes; Luis	Montclair	NJ			
Lehmann; Martin	Princeton	NJ			
Tomschy; Andrea	Grenzach-Wyhlen				DE
Van Loon; Adolphus	Rheinfelden				CH
Vogel; Kurt	Basel				CH
Wyss; Markus	Liestal				CH

US-CL-CURRENT: 424/94.6, 435/195, 435/196, 435/252.3, 435/320.1, 435/471, 435/911,  
435/916, 530/350, 536/23.2, 536/23.7

CLAIMS:

What is claimed is:

1. A modified phytase comprising a mutation in an amino acid sequence of a phytase, wherein the modified phytase has phytase activity and the mutation is at one or more positions selected from the group consisting of: 43, 44, 47, 51, 58, 62, 80, 83, 88, 90, 102, 115, 143, 148, 153, 154, 186, 187a, 195, 198, 201e, 204, 205, 211, 215, 220, 242, 244, 251e, 260, 264, 265, 267, 270, 273, 278, 302, 337, 339, 352, 365, 373, 383k, 404 and 417,

wherein each position corresponds to the position of the amino acid sequence of the mature P. lycii phytase (SEQ ID NO: 7).

2. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: 43A,C,D,E,F,G,H,I,K,L,M,N,P,Q,R,S,T,V,W,Y; 44N; 47Y,F; 51E,A,R; 58D,K,A; 62V,I; 80K,A; 83A,I,K,R,Q; 88I; 90R,A; 102Y; 115N; 143N; 148V,I; 153D,Y; 154D,Q,S,G; 186A,E,P; 187aS; 195T,V,L; 198A,N,V; 201e( ); 201eT; 204E,S,A,V; 205E; 211L,V; 215A,P; 220L,N; 242P,S; 244D; 251eE,Q; 260A,H; 264R,I; 265A,Q; 287D; 270Y,A,L,G; 271D,N; 273D,K; 278T,H; 302R,H; 337T,G,Q,S; 339V,I; 352K; 365V,L,A,S; 373A,S; 383kQ,E; 404A,G; and 417E,R.

3. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; F47Y; A51E,R; A58D,K; V62I; K80A; K83A,I,R,Q; E90R,A; D115N; I148V; S153D,Y; S154Q,D,G; A186E,P; T195V,L; V198A,N; E201e( ),T; V204Q,E,S,A; T211L,V; S215AP; L220N; S242P; K251eE,Q; H260A; I264R; N265Q,A; Q270Y,A,L,G; K273D, H278T; H302R; G337S,T,Q; I339V; S365V,L,A; A373S; Q383kE; P404A,G; and R417E.

4. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: Q43C,D,E,F,H,K,M,P,R,S,W,Y; Y44N; F47Y; E51A,R; K58D,A; I62V; K80A; K83A,I,Q,R; V88K; A90R; F102Y; D115N; S143N; I148V; S153D,Y; D154Q,S,G; S186A,E,P; T187aS; V195L,T; K198A,N,V; Q201e( ),T; V204Q,E,S,A; A205E; L211V; A220L,N; C242P,S; Q251eE,Q; H260A; K264R,I; K265Q,A; N267D; Q270Y,A,L,G; G273D,K; Y278T,H; R302H; S337T,G,Q; V339I; E352K; S365V,L,A; G373S,A; K383kQ,E; D404A,G; and K417E,R.

5. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; Y47F; E51A,R; D58K,A; V62I; K80A; A83I,Q,K,R; A90R; D115N; K143N; I148V; S153D,Y; D154Q,S,G; G186A,E,P; G187aS; T195V,L; A198N,V; E201e( ),T; V204Q,S,A,E; L211V; A215P; L220N; P242S; E244D; E251e,Q; H260A; R264I; Q265A; Q270Y,A,L,G; G273D,K; Y278T,H; R302H; S337T,Q,G; I339V; A352K; S365V,L,A; G373S,A; Q383kE; A404G; and E417R.

6. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: A43C,D,E,F,G,H,I,K,L,M,N,P,Q,R,S,T,V,W,Y; Y44N; Y47F; Q51E,A,R; K58D,A; I62V; A80K; R83A,I,Q,K; V88I; K90R,A; L102Y; D115N; E143N; V148I; S153D,Y; N154D,Q,S,G; S186A,E,P; ( )187aS; M195T,V,L; N198A,V; ( )201eT; Q204E,S,A,V; T205E; I211L,V; P215A; L220N; A242P,S; E244D; ( )251eE,Q; P260A,H; A264R,I; Q265A; E267D; G270Y,A,L; D273K; T278H; E302R,H; Q337T,S,G; I339V; S352K; V365L,A,S; S373A; S383kQ,E; G404A, and E417R.

7. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of: P43A,C,D,E,F,G,H,I,K,L,M,N,Q,R,S,T,V,W,Y; Y44N; F47Y; E51A,R; E58D,K,A; V62I; A80K; R83A,I,Q,K; V88I; K90R,A; A115N; G143N; V148I; D153Y; Q154D,S,G; E186A,P; ( )187aS; M195T,V,L; N198A,V; ( )201eT; E204Q,S,A,V; S205E; V211L; N215A,P; L220N; P242S; ( )251eE,Q; A260H; V264R,I; S265Q,A; E267D; Y270A,L,G; D273K; G278T,H; G302R,H; T337Q,S,G; V339I; A352K; V365L,A,S; S373A; ( )383kQ,E; G404A; and E417R.

8. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of 43P; 47Y,F; 51E,A; 58D; 62V; 80K; 83A; 195T; 198A; 204V; 211L; 242P; 264R; 265Q; 302R; 337S; and 417E.

9. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of 47Y,F; 51A; 83A; 195T; 204V; 211L; 242P; and 265A.

10. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of 43T,L,G; 44N; 58K,A; 62I; 80A; 83K,R; 88I; 90R,A; 102Y; 115N; 143N,K; 148V,I; 154S; 186A; 187aS; 195V,L; 198V; 201eT; 204A; 211V, 215P,A; 220L,N; 242S; 244D; 251eQ,E; 260A,H; 264I; 265A; 267D; 270G; 273K,D; 278T,H; 302H; 337T,G; 339V,I; 352K; 365A,S; 373S,A; 383kE,Q; 404G,A; and 417R.

11. The modified phytase of claim 1, wherein the mutation is selected from the group consisting of 51R; 80A; 154S; 186P; 204Q,S; and 273F.

12. The modified phytase of claim 1, wherein the mutation comprises 43L/270L.

13. The modified phytase of claim 1, wherein the mutation comprises 43L/270L/273D.
14. The modified phytase of claim 1, wherein the phytase is an ascomycete phytase.
15. The modified phytase of claim 14, wherein the phytase is an *Aspergillus* phytase.
16. The modified phytase of claim 15, wherein the phytase is an *Aspergillus ficuum*, *Aspergillus fumigatus*, *Aspergillus nidulans*, *Aspergillus niger*, or *Aspergillus terreus* phytase.
17. The modified phytase of claim 16, wherein the mutation is selected from the group consisting of Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; Y47F; E51A,R; H58D,K,A; V62I, K80A; A83I,Q,K,R; A90R; D115N; K143N; I148V; S153D,Y; D154Q,S,G; I186A,E,P; G187aS; S198A,N,V; E201e( ),T; I204Q,E,S,A,V; I211L,V; P215A; L220N; S242P; E251eQ; E260A,H; L264R,I; Q270Y,A,L,G; S273D,K; G278T,H; Q302R,H; S337T,Q,G; I339V; Q352K; A365V,L,S; G373S,A; E383kQ; A404G; and E417R.
18. The modified phytase of claim 16, wherein the mutation is selected from the group consisting of L43A,C,D,E,F,G,H,I,K,M,N,P,Q,R,S,T,V,W,Y; Y44N; Y47F; Q51E,A,R; P58D,K,A; I62V; K80A; A83I,Q,K,R; A90R; E115N; H143N; V148I; A153D,Y; S154D,Q,G; G186A,E,P; A187aS; L195T,V; A198N,V; T201e( ); A204Q,E,S,V; V205E; V211L; A215P; L220N; P242S; E244E; T251eE,Q; A260H; T264R,I; Q265A; N267D; L270Y,A,G; K273D; H278T; Q302H; N337T,Q,S,G; V339I; A352K; A366V,L,S; A373S; R383kQ,E; P404A,G; and A417E,R.
19. The modified phytase of claim 18, wherein the phytase is an *Aspergillus terreus* CBS 116.46 phytase.
20. The modified phytase of claim 1, wherein the phytase is a *Thermomyces lanuginosus*, *Talaromyces thermophilus*, or *Myceliophthora thermophila* phytase.
21. The modified phytase of claim 20, wherein the mutation is selected from the group consisting of Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; F47Y; A51E,R; Q58D,K,A; I62V; K80A; L83A,I,Q,R,K; R90A; D116S; V148I; S153D,Y; D154Q,S,G; G186A,E,P; S195T,V,L; V198A,N; S201e( ),T; A204Q,E,S,V; Q205E; Q211L,V; A215P; I220N,L; P242S; E244D; ( )251eE,Q; Q260A,H; Q264R,I; A265Q; Q270Y,A,L,G; G273D,K; N278T,H; H302R; T337Q,S,G; T339V,I; A352K; S365V,L,A; G373S,A; D383kQ,E; E404A; and R417E.
22. The modified phytase of claim 21, wherein the phytase is a *Talaromyces thermophilus* ATCC 20186 or ATCC 74338 phytase.
23. The modified phytase of claim 20, wherein the mutation is selected from the group consisting of Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; F47Y; A51E,R; K58D,A; V62I; K80A; V83A,I,Q,K,R; L88I; R90A; F102Y; D115N; E143N; V148I, S153D,Y; A154D,Q,S,G; E186A,P; G187aS, T195V,L; A198N,V; P201e( ),T; Q204E,S,A,V; P205E; V211L; R215A,P; I220L,N; P242S; Q251eE; Q260H; M264R,I; A265Q; Y270A,L,G; D273K; H278T; G302R,H; T337Q,S,G; T339V,I; A365V,L,S; A373S; E383kQ; R404A,G; and K417E,R.
24. The modified phytase of claim 23, wherein the phytase is a *Thermomyces lanuginosus* NRRL B-21527 phytase.



25. The modified phytase of claim 20, wherein the mutation is selected from the group consisting of Q43A,C,D,E,F,G,H,I,K,L,M,N,P,R,S,T,V,W,Y; Y44N; Y47F; P51E,A,R; D58K,A; V62I; R80K,A; S83A,I,Q,K,R; R90A; D115N; K143N; V148I; D154Q,S,G; T186A,E,P; G187aS; L195T,V; A198N,V; T201e( ); A204Q,E,S,V; Q205E; T211L,V; P215A; V220N,L; P242S; E244D; A251eE,Q; E260A,H; R264I; A265Q; Q270Y,A,L,G; K273D; Y278T,H; ( )302R,H; D337T,Q,S,G; M339V,I; P352K; A365V,L,S; A373S; E383kQ; G404A; and E417R.

26. The modified phytase of claim 25, wherein the phytase is a *Myceliophthora thermophila* ATCC 34625 or ATCC 74340 phytase.

27. The modified phytase of claim 1, wherein the phytase is an ascomycete consensus phytase sequence.

28. The modified phytase of claim 27, wherein the phytase is a basidiomycete phytase.

29. The modified phytase of claim 28, wherein the phytase is a *Paxillus involutus*, *Trametes pubescens*, *Agrocybe pediades*, or *Peniophora lycii* phytase.

30. The modified phytase of claim 29, wherein the mutation is selected from the group consisting of M43A,C,D,E,F,G,H,I,K,L,N,P,Q,R,S,T,V,W,Y; Y44N; Y47F; A51E,R; A58D,K; I62V; A80K; R83A,I,Q,K; V88I; K90R,A; L102Y; D115N; D143N; V148I; S153D,Y; D154Q,S,G; A186E,P; ( )187aS; M195T,V,L; A198N,V; ( )201eT; Q204E,S,A,V; V205E; Q211L,V; P215A; L220N; P242S, E244D; ( )251eE,Q; Q260A,H; D264R,I; A265Q; A267D; A270Y,L,G; D273K; T278H; A302R,H; Q337T,S,G; V339I; A352K; L365V,A,S; A373S; ( )383kQ,E; G404A; and E417R.

31. The modified phytase of claim 30, wherein the phytase is a *Trametes pubescens* CBS 100232 phytase.

32. The modified phytase of claim 29, wherein the mutation is selected from the group consisting of P43A,C,D,E,F,G,H,I,K,L,M,N,Q,R,S,T,V,W,Y; Y44N; Y47F; A51E,R; A58D,K; I62V; A80K; R83A,I,Q,K; L88I; K90R,A; F102Y; S115N; I148V; S153D,Y; D154Q,S,G; T186A,E,P; ( )187aS; M195T,V,L; A198N,V; ( )201eT; Q204E,S,A,V; V205E; V211L; S215A,I; L220N; A242P,S; M244D; ( )251eE,Q; P260A,H; E264R,I; A265Q; A267D; G270Y,A,L; D273K; T278H; N302R,H; L337T,Q,S,G; V339I; A352K; R365V,L,A,S; S373A; ( )383kQ,E; G404A; and E417R.

33. The modified phytase of claim 32, wherein the phytase is a *Paxillus involutus* CBS 100231 phytase.

34. The modified phytase of claim 29, wherein the mutation is selected from the group consisting of P43A,C,D,E,F,G,H,I,K,L,M,N,Q,R,S,T,V,W,Y; Y44N; Y47F; A51E,R; A58D,K; I62V; A80K; R83A,I,Q,R,K; L88I; K90R,A; F102Y; S115N; D143N; I148V; S153D,Y; D154Q,S,G; T186A,E,P; ( )187aS; M195T,V,L; A198N,V; ( )201eT; Q204E,S,A,V; V205E; S211L,V; S215A,P; L220N; P242S; M244D; ( )251eE,Q; P260A,H; E264R,I; A265Q; A267D; G270Y,A,L; D273K; T278H; N302R,H; L337T,Q,S,G; V339I; A352K; L365V,A,S; S373A; ( )383kQ,E; G404A; AND E417R.

35. The modified phytase of claim 34, wherein the phytase is a *Paxillus involutus* CBS 10231 Phy-A2 phytase.

36. A feed or food comprising a modified phytase of claim 1.

37. A composition comprising a modified phytase of claim 1.

38. A process for reducing phytate levels in animal manure comprising feeding an animal with an effective amount of the feed of claim 36.

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## Search Results - Record(s) 1 through 4 of 4 returned.

### ☐ 1. Document ID: US 6623954 B1

L5: Entry 1 of 4

File: USPT

Sep 23, 2003

US-PAT-NO: 6623954

DOCUMENT-IDENTIFIER: US 6623954 B1

TITLE: Process for removal of phosphorous from a dairy stream

DATE-ISSUED: September 23, 2003

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Spade; Michael Eugene	Fairless Hills	PA		
Weil; Jonathan Kim	Lansdale	PA		
McHale; Michael Scott	Willow Grove	PA		

US-CL-CURRENT: 435/274; 426/34, 426/41, 426/42, 435/105, 435/168, 435/267, 435/268,  
435/72, 435/99

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw Ds
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### ☐ 2. Document ID: US 6054306 A

L5: Entry 2 of 4

File: USPT

Apr 25, 2000

US-PAT-NO: 6054306DOCUMENT-IDENTIFIER: US 6054306 A

TITLE: Peniophora phytase

DATE-ISSUED: April 25, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lassen; S.o slashed.ren Flensted	Copenhagen .O slashed.			DK
Bech; Lisbeth	Hiller.o slashed.d			DK
Fuglsang; Claus Crone	Niv.ang.			DK
Ohmann; Anders	Br.o slashed.nsh.o slashed.j			DK
Breinolt; Jens	Bagsv.ae butted.rd			DK

stergaard; Peter Rahbet

Virum

DK

US-CL-CURRENT: 435/196; 435/320.1, 435/325, 435/69.1, 536/23.1, 536/23.2

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWIC	Draw. De
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☐ 3. Document ID: JP 3504672 B2, WO 9828408 A1, AU 9853096 A, EP 948606 A1, US 6054306 A, EP 948606 B1, DE 69702720 E, JP 2000512856 W, ES 2150795 T3

L5: Entry 3 of 4

File: DWPI

Mar 8, 2004

DERWENT-ACC-NO: 1998-467148

DERWENT-WEEK: 200418

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TITLE: New isolated Peniophora lycii phytase - used in human food or animal feed, for reducing phytate levels or improving protein availability or bio:availability of minerals

INVENTOR: BECH, L; BREINHOLT, J ; FUGLSANG, C C ; LASSEN, S F ; OHMANN, A ; STERGAARD, P R ; OSTERGAARD, P R

PRIORITY-DATA: 1997DK-0000529 (May 7, 1997), 1996DK-0001481 (December 20, 1996)

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>JP 3504672 B2</u>	March 8, 2004		039	C12N015/09
<u>WO 9828408 A1</u>	July 2, 1998	E	081	C12N009/16
<u>AU 9853096 A</u>	July 17, 1998		000	
<u>EP 948606 A1</u>	October 13, 1999	E	000	C12N009/16
<u>US 6054306 A</u>	April 25, 2000		000	C12N009/16
<u>EP 948606 B1</u>	August 2, 2000	E	000	C12N009/16
<u>DE 69702720 E</u>	September 7, 2000		000	C12N009/16
<u>JP 2000512856 W</u>	October 3, 2000		077	C12N015/00
<u>ES 2150795 T3</u>	December 1, 2000		000	C12N009/16

INT-CL (IPC): A23 K 1/165; C07 H 21/02; C12 N 1/19; C12 N 1/21; C12 N 5/00; C12 N 9/16; C12 N 15/00; C12 N 15/09; C12 P 21/06; C12 N 1/19; C12 N 1/21; C12 N 9/16; C12 N 15/00; C12 R 1/19; C12 R 1:645; C12 R 1:69; C12 R 1:69; C12 N 1/19; C12 R 1:69; C12 N 9/16; C12 R 1:69; C12 N 15/09; C12 R 1:645

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWIC	Draw. De
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☐ 4. Document ID: JP 3415875 B2, AU 9335124 A, EP 571005 A2, CA 2091863 A, US 5291289 A, JP 06054306 A, EP 571005 A3, AU 667512 B, EP 571005 B1, DE 69325126 E, CA 2091863 C

L5: Entry 4 of 4

File: DWPI

Jun 9, 2003

DERWENT-ACC-NO: 1993-352202

DERWENT-WEEK: 200345

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TITLE: TV signal encoding system - maps digital symbols into respective complex symbols and derives coeffs. based on signal reference

INVENTOR: BASILE, C; BRYAN, D A ; HULYALKAR, S N

PRIORITY-DATA: 1992US-0854177 (March 20, 1992), 1990US-0614885 (November 16, 1990), 1991US-0647383 (January 29, 1991), 1991US-0774006 (October 8, 1991)

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>JP 3415875 B2</u>	June 9, 2003		013	H04N007/08
<u>AU 9335124 A</u>	September 23, 1993		036	H04N011/06
<u>EP 571005 A2</u>	November 24, 1993	E	021	H04N007/00
<u>CA 2091863 A</u>	September 21, 1993		000	H04N007/133
<u>US 5291289 A</u>	March 1, 1994		017	H04N005/40
<u>JP 06054306 A</u>	February 25, 1994		000	H04N007/13
<u>EP 571005 A3</u>	August 10, 1994		000	H04N011/06
<u>AU 667512 B</u>	March 28, 1996		000	H04N011/06
<u>EP 571005 B1</u>	June 2, 1999	E	000	H04N007/00
<u>DE 69325126 E</u>	July 8, 1999		000	H04N007/00
<u>CA 2091863 C</u>	May 6, 2003	E	000	H04N007/133

INT-CL (IPC): H04J 11/00; H04L 5/12; H04L 23/02; H04N 5/40; H04N 7/00; H04N 7/06; H04N 7/08; H04N 7/081; H04N 7/13; H04N 7/133; H04N 11/06

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw D
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L2: Entry 1 of 1

File: USPT

Apr 13, 2004

US-PAT-NO: 6720174DOCUMENT-IDENTIFIER: US 6720174 B1

TITLE: Phytases

DATE-ISSUED: April 13, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lehmann; Martin	Princeton	NJ		

US-CL-CURRENT: 435/196; 435/18, 435/195, 530/350, 536/23.2

## CLAIMS:

What is claimed is:

1. A phytase comprising an amino acid sequence which is at least 93.80% identical to the sequence of amino acid residues 1-467 of SEQ ID NO: 26, wherein the % identity is determined by GAP provided in the GCG program package using a length weight of 0 and a gap weight of 3.
2. A phytase that is encoded by a DNA sequence that is at least 95.88% identical to nucleotides 12-1412 of the DNA sequence of SEQ ID NO: 25, wherein the % identity is determined by GAP provided in the GCG program package using a gap creation penalty of 50 and a gap extension penalty of 3.
3. A phytase that comprises: (a) the amino acid sequence of SEQ ID NO: 26 or amino acid residues 1-441 of SEQ ID NO: 26; or (b) the amino acid sequence encoded by nucleotides 12-1412 or 90-1412 of SEQ ID NO: 25.
4. A phytase comprising: (a) the amino acid sequence of SEQ ID NO: 31, (b) the amino acid sequence of SEQ ID NO: 31 in which the amino acid residue at position 24 is glutamine, (c) the amino acid sequence of SEQ ID NO: 31 in which the amino acid residue at position 65 is lysine, (d) the amino acid sequence of SEQ ID NO: 31 in which the amino acid residue at position 24 is glutamine and the amino acid residue at position 65 is lysine, (e) the amino acid sequence of residues 1-441 of any of (a)-(d), or (f) the amino acid sequence encoded by nucleotides 1-1401 or 79-1401 of SEQ ID NO: 30.
5. A phytase comprising: (a) the amino acid sequence of SEQ ID NO: 29, (b) the amino acid sequence of SEQ ID NO: 29 in which the amino acid residue at position 24 is glutamine, (c) the amino acid sequence of SEQ ID NO: 29 in which the amino acid residue at position 65 is lysine, (d) the amino acid sequence of SEQ ID NO: 29 in which the amino acid residue at position 24 is glutamine and the amino acid residue at position 65 is lysine, (e) the amino acid sequence of residues 1-441 of any of (a)-(d), or (f) the amino acid

sequence encoded by nucleotides 1-1401 or 79-1401 of SEQ ID NO: 28.

6. A phytase comprising the amino acid sequence of SEQ ID NO: 27.

7. A food or feed composition comprising the phytase of claim 1.

8. A food or feed composition comprising the phytase of claim 2.

9. A food or feed composition comprising the phytase of claim 3.

10. A food or feed composition comprising the phytase of claim 4.

11. A food or feed composition comprising the phytase of claim 5.

12. A food or feed composition comprising the phytase of claim 6.

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